

WESTERN ORTHOPTERA ATTRACTED TO LIGHTS

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The number of species of Orthoptera recorded as coming to light is extremely small in number. Rockwood (1924), who has published the only list of Orthoptera (Acerididæ) taken at light, reports only fourteen species recorded in the literature for North America. Nine of these were taken from the writings of Rehn and Hebard.

The paucity of reports appears to be due to several factors, namely: the scarcity of observers throughout the country, and in the unusualness of the event in the more northern latitudes of our country where the desultory appearance of Orthoptera at light usually escapes the attention of most workers.

Geographical location seems to play an important role in determining the abundance of species coming to light, and this appears to be directly influenced by the weather conditions prevailing in that particular region.

Positive phototaxis appears to be related to temperature; a temperature above 80 degrees Fah. apparently is a prerequisite of night flying activity with the maximum activity above 90 degrees. This is a contradiction to the results obtained by Parker (1924) and Sviridenko (1924) in their respective studies on *Camnula pellucida* Sc. and *Docioataurus maroccanus* Thunbg. Although they found that temperatures in the neighborhood of 90 degrees Fah. tend to inhibit the movements of these two species, it does not necessarily follow that other species of Orthoptera behave in a similar manner. Quite the reverse seems to be true. The great majority of species recorded and reported in this paper, based on the author's observations, come from the desert regions of southwestern United States. In such regions it is only natural to suspect that life activity optimums for the species inhabiting the desert are much higher than for northern species such as *Camnula pellucida*.

In the northern tier of states very few Orthopterans are attracted to light and those that come are mainly Tettigoniids and Gryllids. It is interesting to note here that during the summer of 1932 the writer took three species of Orthoptera, namely: *Dissosteira carolina* L., *Spharagemon collare* (Sc.) and *Scudderia furcata furcata* Br., at North Branch, Minnesota, the night of July 14, 1932, 9-11 p.m. when the thermometer registered over 95 degrees. The day had been one of the hottest in many years in Minnesota, the shade temperature reaching a maximum of 104 degrees in the late afternoon. While at El Centro in the Imperial Valley of southern California on the night of August 25, 1931, at 7:30 p.m. with a temperature of at least 105 degrees (the late afternoon temperature had been 122 degrees) the writer observed large numbers of *Gryllus assimilis* flying with unusual activity around the street and store lights and running around on the ground below and flying and jumping up into the air towards the object of attraction.

The above remarks are further substantiated by the following observations. For two years, from 1928 to 1930, the author was stationed at the Pink Bollworm Laboratory at Presidio, in the Rio Grande valley of southwestern Texas. There he had an excellent opportunity to observe and collect specimens of the large number of Orthopteran species attracted to the street lights.

Several factors appear to directly influence the nocturnal activity of the Orthoptera in the regions of the Southwest.

Of these temperature is undoubtedly the most important single factor. Early night temperatures during the hottest part of the year when the Orthoptera exhibit their greatest phototaxis seldom ranges below 88 degrees. Hence it appears that high temperatures are conducive to greater activity and light attractivity in the Orthoptera. The following temperature readings from the Hygrothermograph at Presidio, are for the period when the largest number of Orthoptera were coming to light during the 1929 season.

The paucity of the vegetation and its low growth lends favorably to the penetration of light to much greater distance than could be expected in wooded regions such as Minnesota where the density of vegetation and its greenness prevent and absorb much of the light.

Furthermore the desert floor is usually bare, and is in south-

August	8 p.m. temp.	9 p.m. temp.	August	8 p.m. temp.	9 p.m. temp.
23*	89	87	30	91	88
24*	84	82	31	90	88
25*	92	90	Sept. 1
26	79	78	2	84	83
27	90	88	3	89	88
28	88	86	4	81	80
29	82	80	5	90	88

* Indicates bright moonlight in the early part of the evening which greatly reduced the numbers attracted to the lights.

western Texas surfaced with whitish clay and often covered to a greater or lesser degree by a layer of whitish gray cobblestones, and forming what is called the "desert pavement." The desert pavement reflects the light resulting in the greater attractivity of that light. We find therefore that moonlight seems to have a profound effect on the abundance of Orthoptera and other insects attracted to light in the desert regions. The nature of the desert pavement, the sparse low vegetation and the clear dry atmosphere gives the moonlight an intensity that is seldom observed outside of desert regions, and this brilliancy mitigates the effect of artificial light.

Orthoptera come to light in maximum abundance about the end of August and in early September, when shortly after the late summer rains, insect life is at a maximum and the greatest number of Orthopteran species are mature. The night temperatures are high, the humidity usually higher than at other times of the year but at that it is very low, with the result that a great variety of insects come to light which seldom appear at lights elsewhere other than in desert regions. Cicindelidæ, Meloidæ, Cerambycidæ and Scarabæidæ come in variety and in large numbers. Occasionally Hemiptera and Homoptera (especially Cicadellidæ), and rarely Cicadidæ, Mecoptera and Rhopalocera and many other interesting visitors are taken, besides the wealth of moths that ordinarily flock to the lights.

Another point of interest upon which the writer has no datum but which will be briefly indicated here is the question: from what distances are Orthoptera attracted to lights and what is the nature of their night flying activity? Are they attracted directly to the light source from the spot upon which they are resting whether soil

or bush or do they fly around at night and are only accidentally brought to the light whenever they come within the sphere of the light's influence? Concerning this problem it may be said that several species such as *Xanthippus corallipes pantherinus* (Sc.), *Rehnita capito* (Stål) and *Mestobregma plattei corrugatum* (Sc.) taken at light at Presidio, Texas, have not been collected closer to Presidio than the Chinati Mountains which are twenty-two miles north of that place. This does not prove that they do not occur in the immediate vicinity but the writer believes he can truthfully say that so far as the Orthopteran fauna is concerned no effort was spared in collecting them during the two-year period September, 1928, to July, 1930; a total of one hundred and twenty-five species of Orthoptera from Presidio County alone might testify to this statement. There is also the astonishing case of *Dissosteira carolina* L. male taken in Presidio on July 16, 1929, by Scout Paul Lujan. It was immediately brought to the writer on account of its strange appearance. This male was taken alive in Childer's Drugstore window (which was one of the more illuminated spots at night) where nightly many insects were attracted into the store by the luring lights. Many insects became trapped by the windows when they tried to escape on the following day. This undoubtedly happened to this male. *Dissosteira carolina* belongs to the Transitional Faunal Zone, the writer having taken the species commonly in southern Alberta, in the north woods along the Ontario-Minnesota Boundary, and at elevations from 5000 to 8000 feet in the Magdalena Mountains, 25 miles west of Socorro, New Mexico; distinctly a northern species. The extreme southern distributional record for Texas was Lubbock, in the Panhandle region, some 800 miles northeast of Presidio and the record for the Magdalena Mountains is still some 600 miles northwest. How then must we account for this strange record? Was it accidentally introduced; was it breeding in the Rio Grande Valley or was it attracted to the lights while migrating from distant regions? *D. carolina* is one of the few acridids previously recorded as attracted to lights, and this species as well as the other members of the genus *Dissosteira* seem to possess strong positive phototaxis. The writer does not doubt that it was attracted to the lights, but to say whence, from the immediate neighborhood or while travel-

ling from more remote regions is a question that may never be answered. Little is known about insect migrations. We are only beginning to understand some of our common migrants such as *Danaus plexippus* (L.). But it is not beyond the realm of possibility to imagine that some of our Orthopteran species, especially acridids, have considerable night flying activity, when the climatic conditions are propitious.

Rockwood's paper summarizes the fragmentary literature on the subject up to 1924 and lists the acridids taken at light, principally those reported in the writings of the two eminent Orthopterists, Rehn and Hebard.

Acknowledgment with many thanks is due Morgan Hebard of the Academy of Natural Sciences of Philadelphia, who has from time to time, most kindly identified the writer's collection of West Texas Orthoptera, and who sent the writer during the summers of 1930 and 1931, into the Southwest on collecting expeditions, from whence many notes were made.

The writer has also carefully examined all the Orthoptera in the University of Minnesota Collection (recently determined by Morgan Hebard) and recorded all specimens labelled as coming to light.

The number of specimens recorded as attracted to light, especially from Presidio, Texas, is not indicative of the numbers at light, for in most cases only a portion of those at light were taken for identification purposes.

Below is a list of Western Orthoptera taken at light, by the author, unless otherwise stated. Those previously listed in Rockwood's paper have been designated by an asterisk.

LIST OF WESTERN ORTHOPTERA TAKEN AT LIGHT

Blattidæ

Periplaneta americana (Linn.). Tucson, Arizona, 1 ♀, July 23, 1907, (Hebard). Yuma, Arizona, 1 ♂, July 27, 1907, (Hebard).

Panchlora cubensis Saussure. Montemorelos, Tamaulipas, Mexico, 1 ♂, VI, 3, 31, (A. Dampf; at light), (Mex. Govt.). Hebard, 1932.

Arenivaga apache (Saussure). El Ysidro, San Diego Co., Calif., 1 ♂, VIII, 22, 31, (probably this species).

Arenivaga erratica Rehn. Yuma, Arizona, 1 ♂, July 27, 1907, (M. Hebard), (recorded as *Homæogamia erratica*; Rehn and Hebard 1908). Presidio, Texas, 8 ♂, IX, 16, 29.

Arenivaga tonkawa Hebard. Nuevo Laredo, Tamaulipas, Mexico, 1 ♂, VI, 8, 31, (A. Dampf; at light), (Hebard Cln.). Hebard, 1932.

Eremoblatta subdiaphana Scudder. Presidio, Texas, 1 ♂, IX, 9, 28; 2 ♂, V, 15, 30; 1 ♂, V, 16, 30. Common at light at Presidio, Texas.

Mantidæ

Stagmomantis californicus Rehn and Hebard. The males of this species come abundantly to light along the southern border of the United States; especially in southwestern Arizona and southwestern New Mexico the males swarmed to the car lights in mid September of 1931.

Stagmomantis limbata Hahn. This species comes to light occasionally at Presidio, Texas.

Litaneutria minor (Scudder). Presidio, Texas, 1 ♂, X, 20, 28. This species comes commonly to light at Presidio. Rodriguez, Nuevo Leon, Mexico, 4 ♂, VI, 7, 1931, (A. Dampf; at light), (Mex. Govt. and Hebard Cln.). Hebard, 1932.

Acrididæ

Acrydiinæ

Tettigidea lateralis (Say). St. Paul, Minn., 1 ♀, VI, 28, 32, (U. Farm Light Trap for 2-3 a.m.). An occasional one in July and August came to the trap.

Acridinæ

Boottettix punctatus (Sc.). This species which lives only in the bushes of the Creosote Bush (*Covillea tridentata*) came to auto lights in the Saucedo Mountains, 22 miles south of Gila Bend, Arizona, on August 30, 1931.

Syrbula fuscovittata Thos. Presidio, Texas, 3 ♀, VIII, 24, 29; females come occasionally, the males rarely to light at Presidio.

Orphulella pelidna (Burm.). Presidio, Texas, 2 ♂, VIII, 24, 29; 2 ♂, VIII, 26, 29; males come occasionally to light.

Orphulella compta Sc. Las Vegas, Nevada, 5 ♀, VII, 31, 30, (E.

R. Tinkham), fairly common at light. Wellton, Arizona, 2 ♂, 4 ♀, VII, 8, 32, (M. J. Oosthuizen).

Scyllium viatoria viatoria (Saussure). Sycamore Canyon, Baboquivari Mts., Pima Co., Arizona, X, 6-9, 1910, 16 ♂, 16 ♀, (Rehn and Hebard; elevation about 3700 feet), (common in short yellow grass, two attracted to light at night). Hebard, 1924.

Ligurotettix coquillettii kunzei Caudell. Saucedo Mts., 22 miles south of Gila Bend, Arizona, 30, VIII, 31; Gila Mts., 11 miles east of Yuma, Arizona, VIII, 26, 31, comes commonly to car lights.

Ligurotettix c. kunzei and *Ligurotettix c. cantator* R. and H. intermediate form. Jean, on the California-Nevada Line, southwest of Las Vegas, VI, 27, 32, 22 ♂, 7 ♀, (M. J. Oosthuizen).

Oedipodinae

Encoptolophus subgracilis Texensis Bruner. Males and females come commonly to light at Presidio, Texas. Reported by Rockwood 1924 as *E. texensis* Br. Rodriguez, Nuevo Leon, Mexico, VI, 5 to 7, 1931, (A. Dampf; at light) 23 ♂, 35 ♀, (Mex. Govt. and Hebard Cln.). Monterrey, Nuevo Leon, VII, 4 and 5, 1908, (at light), 5 ♂, 2 ♀, (Illinois State). Hebard 1932.

Encoptolophus pallidus Bruner. Wellton, Arizona, 2 ♀, VII, 8, 32, (M. J. Oosthuizen).

Xanthippus corallipes pantherinus (Scudder). Marfa, Texas, 1 ♂, 5 ♀, VI, 4, 30. Presidio, Texas, 1 ♂, 1 ♀, VI, 15, 30; 2 ♀, IV, 25, 30. Comes well to light.

Leprus wheeleri (Thomas). Presidio, Texas, 4 ♂, 1 ♀, VIII, 24, 29; 2 ♀, VIII, 29, 29; 1 ♀, IX, 1, 29; 1 ♂, 1 ♀, IX, 4, 29. Males come abundantly to light at Presidio but only a few females.

**Dissosteira carolina* (Linn.) Presidio, Texas, 1 ♂, VII, 16, 29, (Scout Paul Lujan). North Branch, Minn., 1 ♂, VII, 14, 32, (E. R. Tinkham). Minneapolis, Minn., 1 ♂, VIII, 6, 32, (D. G. Denning).

**Dissosteira longipennis* (Thomas). Various records in the literature according to Rockwood, 1924.

**Dissosteira spurcata* Saussure. Salt Lake City, Utah, 2 ♀, VII, 25, 31.

Spharagemon collare collare (Scudder). North Branch, Minnesota, 1 ♀, VII, 14, 32, street lights.

Spharagemon collare cristatum Scudder. This species comes occasionally to light at Presidio, Texas.

**Spharagemon equale* (Say). Salt Lake City, Utah, 1 ♀, VII, 25, 31, city lights.

Derotmema delicatulum Scudder. Las Vegas, Nevada, 4 ♂, VII, 31, 30 (E. R. Tinkham) (Hebard Cln.). Wellton, Arizona, 1 ♂, VII, 8, 32 (M. J. Oosthuizen). This species comes readily to light.

Trachyrhachis kiowa fuscifrons (Stål). A few taken at light at Presidio.

Rehnacris capito (Stål). Presidio, Texas, 1 ♂, 4 ♀, VIII, 24, 29. It is interesting to note that this species during two years of intensive collecting has never been taken closer than the Chinati Mountains, 22 miles north of Presidio.

Mestobregma plattei corrugatum (Scudder). At Presidio a few females were taken at light but no males.

Mestobregma impezum Rehn. Salt Lake City, Utah, 1 ♀, VII, 25, 31, city lights.

**Conozoa sulcifrons wallula* Scudder. Reported by Rockwood, 1924, 3 ♀ from Boise, Idaho, July 22, 1923.

Conozoa sulcifrons Scudder. Las Vegas, Nevada, 1 ♀, VII, 31, 30 (E. R. Tinkham). Wellton, Arizona, 1 ♂, VII, 8, 32 (M. J. Oosthuizen).

**Trimerotropis texana* Bruner. Presidio, Texas, 1 ♀, VIII, 31, 29; 1 ♂, IX, 3, 29. This species comes only rarely at light at Presidio as it is one of the uncommon species of the region.

**Trimerotropis strenua* McNeill. Tucson, Arizona, 2 specimens, VII, 26, 07 (Rehn and Hebard). Rehn and Hebard, 1908.

Trimerotropis ceruleipennis Bruner. Nevada desert, 15 miles north of Coleville, Calif., several specimens, VIII, 8, 30, attracted to light of Coleman lantern.

**Trimerotropis pallidipennis pallidipennis* (Burm.). Both sexes attracted abundantly to lights throughout the entire desert region. West of Jean on the California-Nevada Line, 2 ♂, 8 ♀, VI, 27, 32 (M. J. Oosthuizen). Recorded by Rockwood, 1924, from Rehn and Hebard, 1908 and 1909, as the synonymous *Trimerotropis vinculata* Scudder, from Alamogordo, New Mexico, 1 sp., July 12, 1907, and Nogales, Ariz., 1 ♂, VIII, 13, 1907.

**Trimerotropis citrina* Scudder. Presidio, Texas, 2 ♀, IX, 4, 29, Raleigh, N. Carolina, 1 ♂, VIII, 19, 04, electric light, (Univ. of Minn. Cln.). Recorded by Rockwood through Rehn and Hebard, 1909, as the synonymous *T. rubripes* Rehn from Alamogordo, New Mexico, 1 ♀, July 12, 1907. Males and females of this species come frequently to light at Presidio.

Trimerotropis laticincta Saussure. Rodriguez, Nuevo Leon, Mexico, VI, 6 and 7, 1931, (A. Dampf; at light) 1 ♂, 2 ♀, (Mex. Govt. and Hebard Cln.). Hebard, 1932. Presidio, Texas, VIII, 24, 29, rare in this region.

Trimerotropis tolteca modesta Bruner. Nogales, Arizona, 1 ♀, VIII, 13, 06, (Dr. Calvert). Rehn and Hebard, 1908 (as *fascicula*).

Anconia integra Scudder. Las Vegas, Nevada, 4 ♂, 3 ♀, VII, 31, 30, (E. R. Tinkham). West of Jean on the California-Nevada Line, 3 ♂, 4 ♀, VI, 27, 32, (M. J. Oosthuizen). This species comes readily to light.

Cyrtacanthracrinæ

Eremiacris pallida Bruner. Las Vegas, Nevada, 1 ♂, 1 ♀, VII, 31, 30. Yermo, Calif., 2 ♀, VIII, 15, 31. Eleven miles east of Yuma, Arizona, a few specimens coming to ear light, VIII, 26, 31. This species comes well to light.

Hesperotettix viridis viridis (Thomas). Wellton, Arizona, 1 ♂, VII, 8, 32, (M. J. Oosthuizen).

Æolopus tenuipennis tenuipennis Scudder. Yuma, Arizona, 7 specs., July 27 and 28, 1907, (Rehn and Hebard) (as *arizonensis*). West of Jean on the Californian-Nevada Line, 9 ♂, 9 ♀, VI, 27, 32, (M. J. Oosthuizen). This species appears to be attracted to light abundantly.

Melanoplus mexicanus mexicanus (Saussure). Wellton, Arizona, 1 ♂, VII, 8, 32, (M. J. Oosthuizen).

**Melanoplus herbaceus* Bruner. Alamogordo, New Mexico, 1 ♀, July 12, 1907, (Rehn and Hebard). Rehn and Hebard, 1909.

Tettigoniidæ

Phanerotropinæ

Arethæa gracilipes papago Hebard. Oracle, Arizona, 4 ♂, 2 ♀, IX, 8, 31, (filling station lights).

Insara elegans elegans (Scudder). Presidio, Texas, 1 ♀, VIII, 28, 29; 1 ♀, V, 18, 30. Deming, New Mexico, 2 ♀, July 20, 1907, at lights, (Rehn and Hebard). Rehn and Hebard, 1909.

Insara elegans conseutipes (Scudder). Oracle, Arizona, 1 ♂, IX, 8, 31, (filling station lights).

Insara covillea Rehn and Hebard. Saucedo Mts., 22 miles south of Gila Bend, Arizona, 5 ♂, 2 ♀, VIII, 30, 31. Ajo, Arizona, 2 ♀, VIII, 31, 31. This species came in fair numbers to car lights.

Scudderia pistillata Bruner. St. Paul, Minn., 1 ♂, VII, 6, 21, (Wm. E. Hoffmann; Como Park lights). St. Paul, Minn., 1 ♀, VI, 29, 21, (Wm. E. Hoffmann), (Univ. of Minn. Cln.).

Scudderia furcata furcata Bruner. North Branch, Minn., 1 ♂, VII, 14, 32. Rodriguez, Nuevo Leon, Mexico, VI, 5 and 6, 1931, (A. Dampf; at light), 5 ♂, (Mex. Govt. and Hebard Cln.). Hebard, 1932.

Scudderia furcata furcifera Scudder. Oracle, Arizona, 2 ♀, IX, 8, 29, (filling station lights).

Microcentrum rhombifolium (Saussure). El Paso, Texas, 1 ♂, IX, 18, 31; Oracle, Arizona, 4 ♂, 1 ♀, (collected at filling station lights in late September for E. R. Tinkham by station man). Nogales, Arizona, 1 ♀, VIII, 13, 06, (Dr. Calvert). Rehn and Hebard, 1908.

Microcentrum californicum Hebard. Campo, San Diego Co., Calif., 2400 feet elev., (M. Hebard) 2 ♂, Type and Paratype, (Hebard Cln.). This new species was described by Hebard in 1932. Oracle, Arizona, 12 ♂, (collected at filling station lights in late September for E. R. Tinkham). This species, an oak inhabitant, came in fair numbers to light while *Microcentrum rhombifolium* living in the cottonwood trees did not seem to be attracted as readily.

Microcentrum stylatum Hebard. Eden, Pis Pis District, Nicaragua, IV, 23 to V, 21, 1922, (W. Huber; at light), 5 ♂ (Acad. Nat. Sci. Phila. and Hebard Cln.). This species was described as new by Hebard, 1932.

Microcentrum myrtifolium Saussure and Pictet. Cuernavaca, Morelos, Mexico, 1 ♂, VII, 1 to 5, 1905, (W. L. Tower; at light), (Amer. Mus. Nat. Hist.). Hebard, 1932.

Anaulacomera laticauda Bruner. Santa Isabel, Sierra Madre,

Chiapas, Mexico, XI, 17, 1930, (at light), 1 ♀, (Hebard Cln.). Hebard, 1932.

Phylloptera festæ Griffini. Near Santa Lurecia, Vera Cruz, Mexico, XI, 9, 30, (on light in train), 1 ♂, (Hebard Cln.). Hebard, 1932.

Copiphorinae

Neoconocephalus ensiger (Harris). Minneapolis, Minn., 1 ♂, VII, 24, 32, (D. G. Denning; city lights).

Neoconocephalus robustus crepitans (Sc.). Lincoln, Nebraska, 1 ♂, Sept.; 1 ♀, Aug., (taken at light), (Univ. of Minn. Cln.).

Conocephalinae

Conocephalus fasciatus fasciatus (DeGeer). Minneapolis, Minn., 1 ♂, VII, 24, 32, (D. G. Denning; at street lights).

Decticinae

Anoplodusa arizonensis (Rehn). Barstow, California, 1 ♂, April, 1931, (Guy Beever), (Hebard Cln.). Yermo, Calif., 1 ♂, VI, 26, 32, (M. J. Oosthuizen). This is one of the rarest decticeids in North America.

Capnobates fuliginosus Thomas. This species is stated as being attracted to lights at Yermo, California, by Mr. Guy Beever. It appeared to show a positive phototaxis to the light from a Coleman lantern while collecting in the Quinlan Mountains about 80 miles west of Tucson, Arizona, the night of September 3, 1931. These two genera are the only fully winged ones of this subfamily found in North America.

Rhaphidophorinae

Ceuthophilus variegatus Scudder. A large specimen was taken at Presidio, Texas, in late August, 1929, under a street light to which it had been attracted.

Gryllidae

Gryllinae

Gryllus assimilis Fab. Faribault, Minn., 1 sp., VI, 19, 22, (Wm. E. Hoffmann).

Gryllus assimilis phase *personatus*. Presidio, Texas, 1 ♂, VIII, 24, 29; 1 ♂, IX, 1, 29. Springerville, Ariz., 2 ♀, VII, 23, 30.

Wellton, Ariz., 3 ♂, 8 ♀, VII, 8, 32, (M. J. Oosthuizen). Tucson, Ariz., 20 ♂, 18 ♀, Jul. 23-26, 1907, (Rehn and Hebard). Rehn and Hebard, 1908.

Miogryllus lineatus Scudder. Wellton, Arizona, 1 ♂, 5 ♀, VII, 8, 32, (M. J. Oosthuizen).

Nemobiinæ

Nemobius fasciatus fasciatus (DeGeer). A number of this species was taken during July and August, 1932, in the Light Trap on the University Farm at St. Paul, Minnesota. Abundant around street lights in Minneapolis on August 14, 1932, (D. G. Denning).

Nemobius fasciatus socius Scudder. This species was very common around street light during July and August, 1928, at Tallulah, Louisiana.

Nemobius carolinus carolinus Scudder. University Farm, St. Paul, Minn., 1 ♂, 1 ♀, VII, 25, 21, (Wm. E. Hoffmann; at lights).

Nemobius carolinus neomexicanus Scudder. Tucson, Ariz., 1 ♀, VII, 23, 08, (Rehn and Hebard), Rehn and Hebard, 1908. Yuma, Ariz., 3 ♀, VII, 27-28, 08, (Rehn and Hebard). Eastland Co., Texas, 1 ♂, XI, 8, 21, Grace O. Wiley.

Æcanthinæ

Æcanthus nigricornis argentinus Saussure. Tucson, Arizona, 1 ♂, 1 ♀, VII, 23-26, 1908, (Rehn and Hebard). Rehn and Hebard, 1908 (as *quadripunctatus*).

Æcanthus niveus (DeGeer). St. Peter, Minn, 1 ♂, VIII, 10, 22, (Sam Kepperly; fish hatchery lights).

Æcanthus californicus Saussure. This species comes occasionally to light at Presidio, Texas.

Mogoplistinæ

Cycloptilum trigonipalpus (Rehn and Hebard). Gainesville, Fla., VII to X, 17, 1923 to 1925, (Hubbell, Walker, Alexander; in room attracted to light during night, under street light) part of 4 ♂, 8 ♀, (Univ. of Michigan Cln.). Hebard, 1931.

Cycloptilum comprehendens fortior Hebard. Kvitak, east of Quijotoa Mountains, 1530 feet, 1 ♂, 1 ♀, IX, 15, 24, (Rehn and Hebard; taken at light). Batamote Well, Valley of the Ajo, 1500

feet, 1 ♂, 1 ♀, IX, 16, 24, (Rehn and Hebard; attracted to camp light at night). Hebard, 1931.

Hoplosphyrum boreale (Scudder). South base of Atascosa Mountain, Santa Cruz Co., 5100 feet, 1 ♀; IX, 22, 24, (Rehn; attracted to light in camp). Hebard, 1931.

SUMMARY

From a perusal of the Orthoptera listed as attracted to light certain general observations can be made.

It is apparent that certain subfamilies are attracted to light better than others. The subfamily Polyphaginae, comprised mainly of desert blattids, come well to light but only in the males as many of these species have apterous females. The mantids, especially the males, possess a strong attraction for light. The females rarely appear, principally due to the great difficulty they find in moving their fat and heavy bodies by wing power. In the Acrididae, the grouse or pygmy grasshoppers of the family Acrydiinae, appear to show a poor response, but this is probably due to the paucity of this subfamily in desert regions. The writer believes that many eastern species will be taken at light. Certain genera of the Acridinae especially those centering around *Syrbula*, *Orphulella* and *Scyllina*, which are strong flyers, show a strong positive phototaxis. Some genera of the Acridinae are brachypterous and cannot be expected to appear at light and other genera will eventually be found appearing at light. The banded winged grasshoppers of the subfamily Eupodinae are all fully winged and strong flying species and exhibit the strongest phototaxis of any of the subfamilies of the Acrididae. The genera *Leprus*, *Dissosteira*, *Spharagemon*, *Mestobregma* and *Trimeroptis* show the greatest attraction, but strange enough *Arphia*, the first of the Eupodine genera, does not appear to be attracted at all. The Cyrtacanthacrinae possess at most only a feeble interest in light, and aside from the genus *Eremiacris*, I have never taken a specimen at light. The genus *Melanoplus*, the largest in North America and comprising many fully winged species, would appear from the few records, to show only a weak positive phototropic response.

All the Tettigoniidae in the winged species appear to come

abundantly to light, especially, the members of the subfamily Phaneropterinae. All the genera of the Decticinae except *Anoplodusa* and *Capnobotes* are brachypterous, and the Rhaphidophorinae without exception are apterous and hence if positively phototropic could only appear at light by hopping to it.

The Gryllidæ possess the strongest light attraction of all the families of the Orthoptera and the Gryllinae and the Nemobiinae are seen commonly at light when no other Orthopterans are present. It is interesting to note that the Tettigoniidæ and the Gryllidæ behave like the Heterocera showing a strong phototaxis to light of weak intensity and a strongly negative reaction to intense light, such as daylight or sunlight.

The writer realizes the list is incomplete with practically no mention of eastern and southeastern species, but by its very incompleteness it is hoped this paper may stimulate interest in this line.

COMMENTS BY MORGAN HEBARD

Since the preparation of this paper by E. R. Tinkham a number of additional records of Orthoptera attracted to light in the southwestern United States have been published. Although it is true that many Cyrtacanthacrinae do not seem to be attracted to light, we found that, considering its scarcity, individuals of *Melanoplus splendidus* came to light surprisingly often near Santa Fé, New Mexico, while *Capnobotes bruneri*, a carnivorous decteid, which in the early summer was there abundant, did so in far lower ratio.

Our observations at Santa Fé further showed very definitely that Orthoptera came to light for two very different reasons. Thus *Arenivaga* and a number of other little if at all predatory species were confused and dazzled; on the other hand such fierce carnivores as *Stagmomantis limbata*, *Stenopelmatus fuscus* and several species of *Ceuthophilus* were often at the lights, not at all confused and evidently engaged in hunting. A specimen of *Stagmomantis limbata*, hiding on the back of the light reflector and poised to grasp the first moth which might come in reach, illustrated this particularly well. We must confess, on the other hand, that we were and are decidedly puzzled by the fact that, though not at all common in the vicinity, individuals of *Pseudosermyle straminea* came to light a number of times. Both males

and females of that walking-stick, at such a time, were invariably very alert and not at all confused, but the species is certainly not predatory. Warm evenings were, as is well known, the best for such collecting, but a number of single captures of particular interest were made on chilly evenings late in the season. Though showers seemed to have little effect, this was probably due to the almost invariable and immediate sharp drop in temperature at 7000 feet, though the region is decidedly arid and was particularly so in 1934. In the arid lowlands of the southwestern United States we have found collecting of Orthoptera at light usually productive of small results, but on some nights Orthoptera appears there about lights in enormous numbers. This we believe is due to heat and showers (which so rarely occur there), but it seems quite probable that other unknown factors are of as great if not even greater importance.

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